DETAILED ACTION

Response to Arguments

1. Applicant argues that it would not have been obvious to modify the Wheeler reference to teach a pressure recovery drop that is perpendicular to fluid flow, since Wheeler explains that the use of a pair of side walls which converge toward each other as they progress upstream generates a pair of counter rotating vortices (Wheeler, col. 5, lines 50-65). Examiner agrees that one would not be motivated to modify Wheeler to provide a pressure recovery drop that is perpendicular to the fluid flow, because that would negate one of the goals of Wheeler in creating the vortices. However, Examiner respectfully asserts that the rejection does not attempt to modify the Wheeler invention, but rather modify the Wells (primary teaching) drop face with the different aspects of the Falco, Wheeler and Fronek inventions to achieve the claimed invention. Wheeler simply teaches a drop face that at some point, smoothly blends into the primary surface. The teaching of gradually blending the drop face into the surface is the only aspect of the Wheeler design that is intended to be incorporated into the Wells invention. Note that the Wheeler invention is not modified.

Double Patenting

2. Applicant's Terminal Disclaimer submitted 5/23/2012 has been approved and all Double Patenting rejections are withdrawn.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. Claims 1-5, 7,8, 13, 15, 16, 18 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wells et al. (U.S. Patent 5505409) in view of Falco et al. (U.S. Patent 5133519) and in further view of Wheeler et al. (U.S. Patent 4,455,045) and Fronek et al. (U.S. Patent 5848769).

4. In regards to claims 1 and 18, Wells et al disclose a fuselage comprising the following:

a. a frontal fuselage portion that leads through a fluid (col. 3, lines 55-59). Note that Wells et al disclose a “frontal portion of the fuselage” which inherently “leads through a fluid (air);

b. an outer fuselage surface relating with said frontal fuselage portion that receives fluid flow thereon (see Wells et al fig. 3 following);

c. at least one fluid flow regulator featured and operable with said outer fuselage surface and extending at least a partial distance around said fuselage (items 20 of Wells et al fig. 3 following and col. 4, lines 63-67);

d. fluid flow regulator comprising a leading surface and a trailing surface (see Wells et al fig. 3 following);

e. a pressure recovery drop extending a pre-determined distance between said leading and trailing edges/surfaces to form a down step, said pressure recovery drop comprising at least one drop face of a calculated distance (col. 3, lines 30-35), said fluid flow regulator functioning to regulate existing pressure gradients along said fuselage/surface subject to external flow of fluid to optimize and equalize said fluid flow and to reduce the separation potential of said fluid (see Wells et al fig. 3 and col. 3, lines 30-54);

f. a sub-atmospheric barrier generated at the base of said drop face as said fluid encounters and flows over said pressure recovery drop, said sub-atmospheric barrier comprising a low pressure area of fluid molecules having decreased kinetic energy that serve as a cushion between said higher kinetic energy fluid molecules in said fluid and the molecules at said outer fuselage surface to facilitate laminar flow and assist in the reduction of the separation potential of said fluid (col. 3, lines

40-45). Note that the "step" disclosed by Wells et al creates a "low pressure area" and thus helps to reduce the separation potential of the fluid;

g. a trailing edge that defines and extends from the base of said pressure recovery drop that provides a trailing flow boundary for said fluid (see Wells et al fig. 3 following). Note that the "trailing surface" extends from the "pressure recovery drop" and inherently provides a trailing flow "boundary" for the fluid;

Wells et al fail to explicitly disclose that the pressure recovery drop is orthogonal or that the pressure recovery drop is perpendicular to the fluid flow. However, Falco et al disclose a drag reducing device incorporating orthogonal pressure recovery drops (see Falco et al fig. 1 following) and where the drop is perpendicular to the fluid flow. It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to incorporate orthogonal pressure recovery drops as disclosed by Falco et al, since orthogonal drops induce the greatest flow separation.

Further, Wells et al fail to teach that the height of a drop face varies along the length of a given drop face. However, Falco et al teach a drop face that varies in height along its length (see Falco figures 7-9 following). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to incorporate a drop face which varies in height along its length as taught by Falco with the apparatus of Wells as modified to enhance mixing after the flow separation.

Wells fails to teach that the drop face comprises a limited length that further comprises a blended end that gradually blends into surface. However, Wheeler et al (henceforth referred to as Wheeler) teaches a vehicle with means for maintaining attached flow of a fluid on a surface that includes multiple "drop faces" where at least one has a “limited length” that blends into the surface (see Wheeler figures 1-5). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to blend some of the drop faces of Wells into the surface as taught by Wheeler, since blending provides a more aerodynamic transition.

Wells et al as modified fail to disclose that the fluid flow regulator is capable of being repositioned in any direction about a surface. However, Fronek et al disclose a removable “fluid flow regulator” (drag reduction article) that is inherently capable of being repositioned in any direction on a surface (col. 1, lines 10-35 and col. 5, lines 52-62). It would have been obvious to one of ordinary skill in the art at the time of Applicant’s invention to make the fluid flow regulator “removable” as disclosed by Fronek et al, so that the fluid flow regulator can be replaced after damage.

Wells et al as modified also fail to disclose that the fluid flow regulator is removably attachable. However, Fronek et al disclose an “an article applied to surfaces to reduce the drag caused by fluids flowing across the surface” that is capable of being removeably attached to that surface (col. 1, lines 21-25) and positioned in “any” direction relative to airflow desired. It would have been obvious to one of ordinary skill in the art at the time of applicant’s invention to incorporate the ability to remove and

reapply the modified Wells et al apparatus as taught by Fronek et al, so that the "fluid flow regulator" can be more easily subjected to routine maintenance or be replaced.

8. In regards to claim 2, Wells et al as modified disclose a pressure recovery drop is positioned at or proximate an optimal pressure recovery point defined as the location(s) about said surface at which there is an imbalanced or unequal pressure gradient forward and aft of said fluid, thus creating an adverse pressure about said fuselage, which adverse pressure gradient induces friction and pressure drag that ultimately increases the separation potential of said fluid (col. 28-35). Note that Wells et al disclose positioning the "steps" at a point where the nose meets the fuselage and/or along the length of the fuselage.

9. In regards to claim 3, Wells et al as modified disclose that the pressure recovery drop is oriented substantially perpendicular to the direction of flow of said fluid (see Wells et al fig. 3 following).

10. In regards to claim 4, Wells et al as modified disclose that the pressure recovery drop comprises a linear formation (see Wells et al fig. 3 following).

11. In regards to claim 5, Wells et al as modified disclose that the fluid flow regulator extends annularly around said fuselage (col. 4, lines 63-67).

12. In regards to claim 7, Wells et al as modified disclose that the pressure recovery drop extends about only a portion of said outer fuselage surface (col. 3, lines 55-59). Note that Wells et al disclose that the “steps” extend longitudinally along the “forward portion” (only a portion) of the fuselage.

13. In regards to claim 8, Wells et al as modified disclose that the outer fuselage surface features a plurality of fluid flow regulators that function together to regulate, influence, and control fluid flow and its properties and characteristics across said outer fuselage surface (see Wells et al fig. 3 following and col. 3, lines 39-45 and 55-59).

14. In regards to claim 13, Wells et al as modified disclose that the fluid flow regulator is integrally formed with said outer fuselage surface (see Wells et al fig. 3 following).

15. In regards to claim 15, Wells et al as modified disclose that the pressure recovery drop comprises a plurality of drop faces to magnify the influence of fluid flow regulator on said fluid (see Wells et al fig. 3 following).

16. In regards to claim 16, Wells et al as modified disclose that the fuselage comprises a fuselage of an aircraft (col. 1, lines 5-12).

17. In regards to claim 19, Wells et al as modified disclose that the moving body comprises the fuselage of an airplane or other similar aircraft (col. 3, lines 55-59).

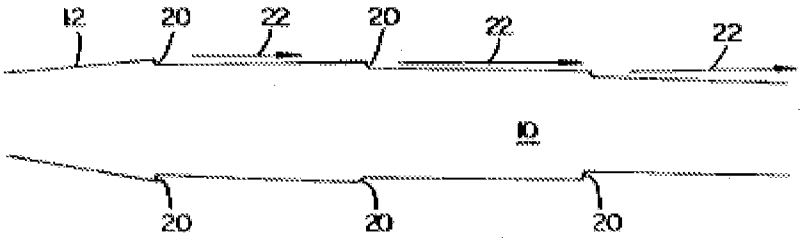

Fig. 3

Wells et al

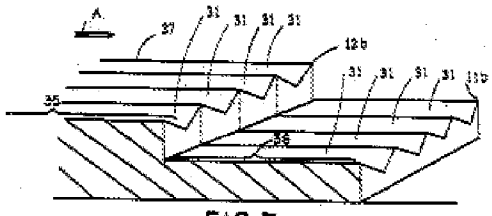

FIG. 7

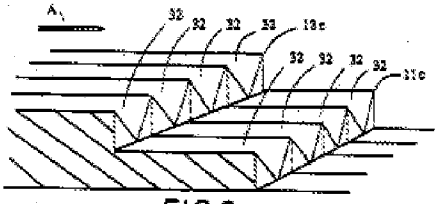

FIG. 8

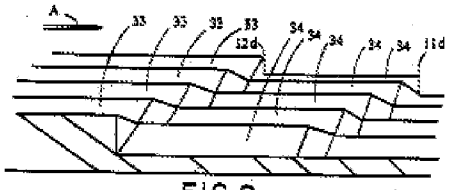

FIG. 9

Falco et al

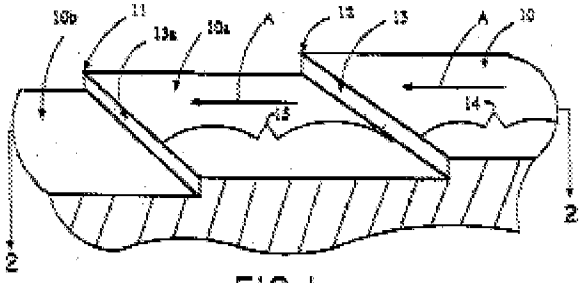

FIG. 1

Falco et al

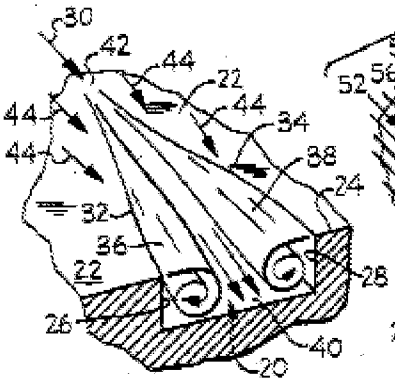

FIG. 1

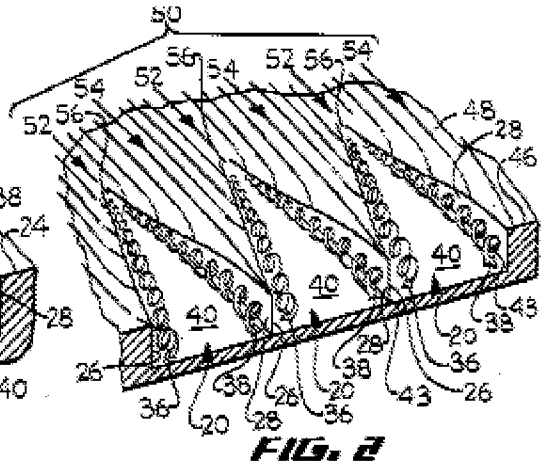

FIG. 2

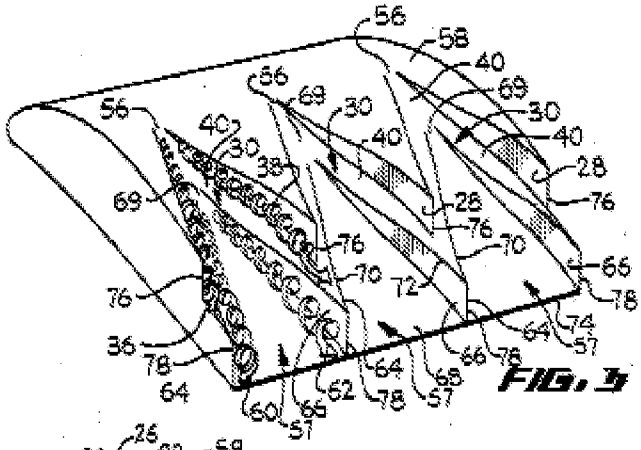

FIG. 3

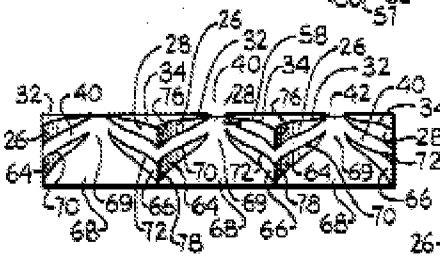

FIG. 4

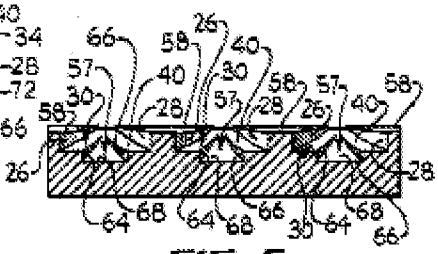

FIG. 5

18. Claims 9, 10, 12 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wells et al. (U.S. Patent 5505409) and Falco et al. (U.S. Patent 5133519) and Wheeler et al. (U.S. Patent 4,455,045) and Fronek et al. (U.S. Patent 5848769) as applied to claims 1 and 18 above, and further in view of Smith et al. (U.S. Patent 4890803).

19. In regards to claims 9, 10 and 12, Wells et al as modified fail to disclose that the fluid flow regulator is a dynamic fluid flow regulator capable of adjusting, on demand, with varying design constraints, flow characteristics, environmental conditions, and operational situations pertaining to said fluid, said object, and any combination of these. However, Smith et al disclose a "fluid flow regulator" (item 26 of Smith et al fig. 3 following) that is "movable" to manipulate flow characteristics (col. 3, lines 42-46 and 57-65) and is inherently capable of "adjustment" to meet any of Applicant's stated conditions or situations. Note that this is equivalent to Applicant's adjustable "pressure recovery drop". It would have been obvious to one of ordinary skill in the art at the time of applicant's invention to incorporate a "movable" (adjustable) "fluid flow regulator" (pressure recovery drop) into/onto a fluid flow surface as disclosed by Smith et al, so that an operator can control the fluid flow dynamics and thus the lift generation of the fluid flow surface (body) is capable of manipulation according to the angle at which the fluid flow surface interfaces the direction of fluid flow (angle of attack). Note that based on the common definition of oscillate, "to move repeatedly from side to side or up and down between to points", presented by the Cambridge Dictionary of American English

(www.dictionary.cambridge.org), the "movable pressure recovery drop" as stated by Applicant in claim 10, is inherently capable of "repeated [movement] between two points" and therefore Applicant's claim 12 is equivalent to claim 10.

20. In regards to claims 17, Wells et al as modified fail to explicitly disclose that the pressure recovery drop comprises an orthogonal design. However, Smith et al disclose a "drop" that is at a right angle to the fluid flow surface (see Smith et al fig. 3 following). It would have been obvious to one of ordinary skill in the art at the time of applicant's invention to require that the "drop" is at a right angle to the flow surface as disclosed by Smith et al to achieve the most significant pressure drop.

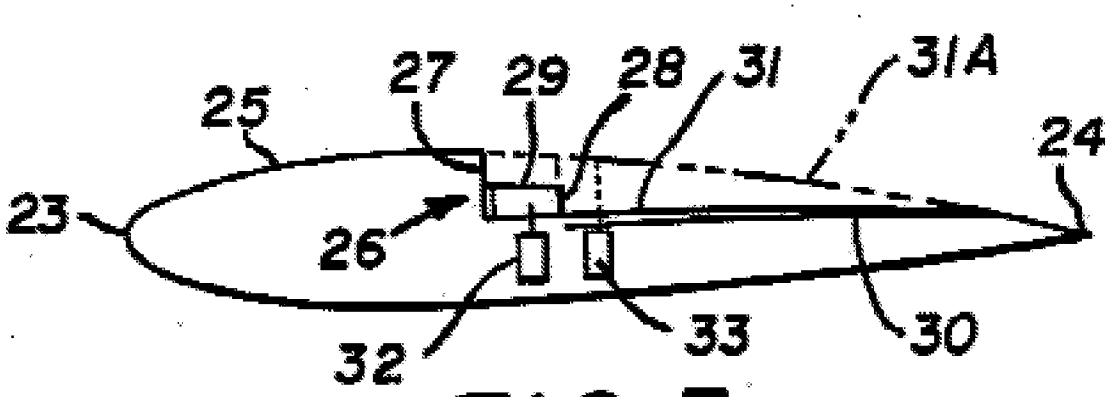

FIG. 3

Smith et al

Summary/Conclusion

21. Claims 1-5, 7-10, 12, 13 and 15-19 are rejected.

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Benjamin P. Lee whose telephone number is 571-272-8968. The examiner can normally be reached between the hours of 8:30am and 5:00pm on Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Carone can be reached on 571-272-6873. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300. Information regarding the status of an application may be obtained from the Patent

Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/BENJAMIN P LEE/

Primary Examiner, Art Unit 3641